

GROUNDWATER BRANCH KENTUCKY DIVISION OF WATER

Operation And Maintenance Practices For Constructed Wetland Onsite Wastewater Treatment Systems

Residential constructed wetland wastewater treatment systems require minimal operation and maintenance. But some time is required to care for the system so that it remains effective and is an attractive part of the residence.

To prevent or identify problems early the system should be checked on a regular basis. The following guidelines address routine operation and maintenance, as well as potential problems that generally occur only when the wetland system has been abused.

START UP

Ideally, plants should have one growing season before any wastewater is continually sent to the system. This time period enables the plants to develop good root systems throughout the cell substrate. Unfortunately, most systems are placed into service as soon as they are completed. In these instances, plan and conduct an extended start-up period under reduced wastewater loading conditions, if at all possible. During this time, add water or wastewater to maintain the water level and apply liquid fertilizer for good plant growth.

1. **Flow Distribution:** For surface distribution, adjust each swivel tee on the distribution pipes to get equal flow from each tee. This is done by trial and error. Insert a lever (short section of like-size pipe) into the tee, and then gently rotate the tee to the proper elevation. Set the overflow elevations from the tees so that the distributor pipes will be about half full of water.
2. **Water Level:** Maintain the water level approximately one inch above the gravel substrate surface until the plants have about one to two feet of new growth. This may not be possible in an unlined cell.
3. **Sprinkler Use:** If the system has a second wetland cell, the water level in the second cell should be checked at least once a week. If the water level is more than two inches below the top of the gravel or deeper than the root depth of the plants, water the cell with a sprinkler at least weekly during dry periods of the growing season. Run the sprinklers for at least two hours, or more often than once a week if plants are not growing well.

Don't mow the newly planted grass around the system until the grass is at least four inches high. Don't cut it any lower than three inches until it is fully established. Give the grass at least the first two growing months after planting before mowing. Also, while mowing, avoid blowing the grass clippings onto the wetland cells.

THE SEPTIC TANK

1. Follow the operation and maintenance practices for a conventional septic system. Do not allow the septic tank to fill with solids to the point that they flow over into the wetland cell. The solids can plug the distributor pipe and gravel, resulting in sewage backing up into the house plumbing and surfacing in the wetland cell. Cleaning up the mess is expensive and time-consuming, so check the depth of solids in the tank after three to five years of operation. See page 6 in the Fall, 1995 issue of Pipeline—Pumping and Inspecting Your

System—What to Expect, for advice on pumping the tank.**

2. If the septic tank is equipped with filters, have them cleaned whenever the tank is pumped. Have this done by a licensed septic tank pumper. The filter should be cleaned by spraying with clean water according to the manufacturer's directions. If household plumbing fixtures fail to drain properly, the filter is a likely source of the problem. It should be inspected and cleaned as necessary. If drainage problems occur, the septic tank has been adversely affected by excessive water flow or by harmful chemicals being disposed in the home.

WATER LEVEL

1. During normal operation, maintain water level in the first cell approximately one inch below the gravel substrate surface at the inlet end. To conveniently check the water level relative to the gravel surface, remove the caps from the observation standpipes at each end of the inlet distributor or remove a small area of mulch and dig a shallow hole in the gravel. Be sure to replace the caps or fill the hole when finished. Remember that water levels will temporarily increase with flow surges.
2. During extended no-flow periods, the water level still must be maintained in the bed. Without flow, water in the cell will evaporate in hot weather and freeze in severe cold. Both extremes will damage roots and tubers over a prolonged period. Before leaving for a long vacation, make arrangements for having water added to the system as needed.
3. Pump systems: Adjust pump floats, pump outlet valve, and water level so that the pump cycle does not cause wastewater surging above the mulch layer. Occasional adjustments may be necessary as the system matures to keep the surges below the mulch or gravel.
4. Check the adjustable standpipe or hose in the water-level control structure for leaks from the joints. Repair any leaks. First, shut off the flow using the valve located in front of the adjustable standpipe or hose. Open the valve as soon as repairs are completed.
5. Surface Ponding:
 - a. If surface ponding occurs in a wetland cell and it cannot be controlled by water level adjustment, it may be due to water flow exceeding the size of the system, clogging of the substrate by excessive solids from the septic tank, or by microbial growth due to excessive organic loading.
 - b. Determine if solids are collecting in the inlet distributor pipe. To do this, make a cleaning gig out of wire and a sponge. Snake the wire from one end of the distributor pipe through the other end. Wrap one end of the wire around a sponge or other material that is large enough to be compressed when pulled through the pipe. Pull the sponge through the pipe several times. If there is a large amount of solids in the pipe, the wetland is being plugged by excessive solids discharging from the septic tank.
 - c. To temporarily correct the problem, drain the cell and let it dry for a week. A permanent correction will probably require replacing the gravel from the inlet to the point where flow reenters the gravel.

- d. Implement actions to prevent the problem from recurring, such as pumping the septic tank more frequently, installing a septic tank filter or another septic tank in a series, and eliminating the use of any toxic chemicals with the potential to “upset” the septic tank.
- e. If there is little or no solids buildup in the inlet distributor pipe, the ponding is probably caused by water flow that exceeds the ability of the substrate to handle. Corrective measures include using less water, installing water-conserving fixtures and low-flow toilets, or installing another parallel wetlands cell.
- f. Temporary increases in water levels may be expected with flow surges. Don’t make any major corrections unless the water level stays above the gravel or mulch surface for an extended period.

INLET DISTRIBUTOR

- 1. Buried Distributor: Periodically check the water level in the cleanouts on each end of the inlet distributor. If the water level in the cleanouts is obviously higher than the top of the gravel, the holes in the distributor pipe or the large stone around the pipe are becoming clogged. Clean the pipe using the homemade cleaning gig described above. If cleaning the pipe doesn’t solve the problem, the large stone can be cleaned by carefully pouring an oxidizing chemical (bleach or hydrogen peroxide) into the distributor pipe cleanouts. Be sure to replace any wetland plants that were killed in the inlet area.
- 2. Small Systems with Pump: Clean the distributor pipe once each season (spring, summer, fall, winter) by removing the end caps and running the homemade cleaning gig through the pipe several times.
- 3. Surface Distributor: Check and maintain the distributor tees so that the flows are approximately equal. If a tee becomes partially blocked by solids, algae, or other materials, flush them out of the distributor pipe by temporarily removing an end cap/plug or turning an end tee down one at a time. The flow of water should flush out most solids. Remove any material such as paper, sticks, or rags that may block a tee. Periodically brush each tee to remove algal growth.

LINER

- 1. Prevent ultraviolet (UV) degradation to the sides of synthetic liners (EPDM, polyethylene, PVC, hypalon, neoprene, butyl rubber, etc.) that extend above the substrate and water level by maintaining good cover over the sides.
- 2. Periodically check for liner leaks. Dyes should be used to verify leaks. Leaks around the inlet and outlet pipes may be due to caulking pulling away from the liner. If this is the problem, recaulk as needed. Draining and repairing leaks should be done within one day to avoid potentially killing the wetland vegetation.

BERMS/RETAINING WALLS

- 1. Repair any erosion on earthen berms as soon as it is noticed.
- 2. Repair leaks around the berms/retaining walls as soon as they occur by plugging or sealing them.
- 3. Mow earthen berms or around the retaining dikes to maintain an attractive site.

PUMPS

1. If a pump is part of the treatment system, maintain the pump according to manufacturer's directions.

WETLAND VEGETATION

Properly maintain wetland vegetation:

1. Routinely check for signs of diseases or other stress (yellowing or browning, withering, spots, etc.). Some of these symptoms occur naturally with seasonal changes and as the plants mature, especially after seeds have matured. First, check water level control pipe/hose to assure correct operation. If the water level is o.k., ask the local agricultural extension agent, county environmentalist, or a knowledgeable garden center for advice.
2. If the vegetation doesn't appear healthy and water levels are being correctly maintained, add a balanced liquid fertilizer periodically (three times in a growing season) to the wastewater by flushing the fertilizer down the toilet. "Normal" domestic sewage may not contain all the trace elements and nutrients required by the wetland vegetation.
3. Pick off large insects (caterpillars, slugs) that cause damage to the wetland vegetation. A serious infestation that is destroying the vegetation requires the application of an insecticide. Obtain guidance for selection of the proper chemical and its application rate. Your agricultural extension agent or a good garden center should be able to advise you.
4. Replace dead plants as needed to fill the voids.
5. Remove "volunteer" weeds, trees, and shrubs from the cells. They will shade and crowd the wetland plants.
6. Prevent excessive shading by controlling tree and high shrub growth near the wetland cells. Most wetland plants require at least six hours of sunshine every day.
7. Remove mature wetland vegetation after the plants have browned in the fall, if desired for aesthetic reasons. Cut only about two-thirds the height of the plants. The removed vegetation may be laid on the bed as mulch.
8. Encourage deep root growth:
This can be done by lowering the water level over several weeks during the dormant vegetation period. Do not drop the water level too low too quickly and leave the roots without water.
Suggested procedure: After frost has killed the top of the plants, lower the water level below the gravel surface to one-third the gravel depth (i.e., 4 inches for a 12-inch depth) for a week; raise the level back to 1 inch below the surface for a week; drop the level two-thirds the depth (i.e., 8 inches for a 12-inch depth) for a week; again raise the level to 1 inch below the surface for a week; drop the level to 1 inch above the wetland cell bottom (i.e., 11 inches for a 12-inch depth) for a week; then raise the level to 1 inch. Repeat this cycle one time.
9. Divide and replant decorative flowering species, such as iris, to enhance the system's attractiveness.

ODOR CONTROL

1. Odors are caused when water stands on the substrate surface. Level out any low or high spots on the substrate surface, which would create small standing pools by raking and/or filling in with additional substrate material. If the standing water is caused by too high a water level, lower the level using the water-level control device. The water level should be one inch below the substrate surface.
2. Water standing or flowing through the water-level control structure and open observation pipes will also cause odors. The only time odors would be noticed coming from these structures is if the caps or covers are loose or removed. Be sure to securely replace the caps/covers after removing to prevent odors from escaping.

DRAINFIELD

1. Mow the area to keep it attractive.
2. Surfacing of wastewater above the drainfield for extended periods may indicate some extensions are not receiving water. Check the risers. If any section is not receiving water, a pipe may have separated or been crushed. Repair if needed. Installing water-conserving plumbing fixtures or additional drainfield area may be necessary.

MISCELLANEOUS

1. Repair leaky plumbing fixtures as soon as they are noticed. A leaky or stuck commode flap allows loss of a large amount of water in a short time, reducing the treatment effectiveness of the wetland.
2. Do not apply herbicides and pesticides on or near the system. They can damage the wetland vegetation. Always seek the advice of the county agricultural extension agent, county environmentalist, or knowledgeable garden center when use of chemicals is indicated.
3. Maintain a three-inch mulch layer on top of the substrate. Mulch can be litter from the wetland vegetation, pine straw or bark, or other suitable material.
4. Prevent animals from digging in the constructed wetland, destroying vegetation and making holes in the substrate and mulch.
5. Reroute any surface drainage around or away from the wetland cell(s).

HEALTH AND SAFETY

1. Do not allow children to play in the wetland cell. They could come into contact with disease-causing organisms.
2. Keep a tight-fitting lid on the water-level control structure. This lid can be secured with a latch and lock if a potential safety problem is a strong consideration.

ADDITIONAL INFORMATION

1. If any unusual problems occur, contact the local county health department.
2. This guideline was modified after the one in GENERAL DESIGN, CONSTRUCTION, AND OPERATION GUIDELINES: CONSTRUCTED WETLANDS WASTEWATER TREATMENT SYSTEMS FOR SMALL USERS INCLUDING INDIVIDUAL RESIDENCES, SECOND EDITION, prepared by Gerald R. Steiner, P.E., and James T. Watson, P.E., published in May, 1993 (TVA/WM—93/10).
3. Questions about the guidelines may be directed to the authors at: Tennessee Valley Authority, Water Management, Haney Building 2C, 1101 Market St., Chattanooga TN 37402-2801, or call them at 615/751-3164.

**The Fall, 1995 issue of Pipeline may be obtained free on request by contacting Patricia Keefe, Groundwater Branch, Kentucky Division of Water, 14 Reilly Road, Frankfort KY 40601; 502/564-6120.